



FABRICATION AND MECHANICAL ANALYSIS OF JUTE-SISAL HYBRID COMPOSITE

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ABSTRACT

The eco-friendly nature as well as processing advantage, light weight and low cost have enhanced the attraction and interest of natural fibre reinforced composite. The objective of current study is to study mechanical and interfacial properties of jute reinforced low density polyethylene composites and sisal fibre low density polyethylene composites and to compare the properties with jute-sisal reinforced hybrid composite. The composites are to be prepared by film stacking followed by hot compaction process. Tensile, flexural, impact and hardness tests are to be conducted for mechanical characterization.

Keywords: jute, sisal, LDPE, hybrid, natural composite.

1. INTRODUCTION

Natural fibres have received great attention among researchers and scientists as reinforcement for polymer matrix in place of synthetic fibres. [1] Advantages of natural fibres include low cost, low density, easy availability, environment friendly, non-toxicity, high flexibility, renewability, biodegradability, high specific strength and modulus, and easy processing. However, natural fibres possess high moisture absorption, low impact strength and low thermal stability. Hybridization technique is used to overcome these drawbacks of natural fibres. Many researchers used hybridization technique and found its positive effect as increase in mechanical, thermal and dynamic mechanical properties. The current study aims at finding the variation in mechanical properties as a result of hybridization of two natural fibres namely jute and sisal in LDPE matrix which is a commonly used thermoplastic.

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Prasad *et al.* performed alkali treatment and acrylic acid treatment of composite fibre which led to the enhancement of mechanical and water resistant properties of composite. So in this project NaOH as well as acid treatment was done on the fibre sheets [2]. Arfin *et al.* indicated that the bulk density of the jute composites decreases due to increases the wt% of the jute fiber and also the water absorption is dependent on fibre addition and length of soaking time [3].

Rao *et al.* proved that the jute/sisal (20/20) hybrid composite exhibits higher tensile modulus, than the other fibre reinforced composites. Again the flexural strength of jute sisal hybrid composite is low compared to pure sisal

and pure jute composites [4]. Singha *et al.* indicated that the values of the Young's modulus of the natural fibre reinforced composite increased progressively with increasing fibre loading [5]. M.K Gupta *et al* concluded that 70:30 ratio for jute: sisal gave better thermal stability at higher temperature than epoxy resin based composites [6].

METHODOLOGY

The plan of project is to make an analysis of mechanical properties of natural fibre reinforced composite and to study the change in properties in a composite obtained by hybridisation of two natural fibres. This paper also analyse the mechanical properties of a hybrid composite formed by film stacking followed by hot compaction process. The project finally yields necessary analysis required for further studies in hybridisation of natural fibres using sheet type matrix. The main steps to that were involved in the project to list are thermal characterisation of LDPE matrix. To find mechanical properties of individual fibre composites such as tensile flexural tensile and impact. To do comparative analysis and to determine whether the hybrid can successfully used as a substitute for jute composite but with lighter weight.

Thermal characterization

Differential scanning calorimetry in Figure-1 and thermo gravimetric analysis in Figure-2 done on available LDPE sheet material indicates the various stages in temperature treatment of LDPE which is very essential for hot compaction. Glass transition temperature and the melting temperature range are very important observation made and 150 °C was the processing temperature selected.